

Application No. 09/819,382
Response to Office Action

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Listing of Claims:

1. (Original) An angle demodulation apparatus comprising:
a first oscillator for generating a first local oscillation
signal and a first phase signal whose phase differs from that of
said first local oscillation signal substantially by 90 degrees;

5 a first mixer for externally receiving an angle modulation
signal, receiving said first local oscillation signal and said
first phase signal from said first oscillator, generating a first
base band signal comprised of that of a product of an

instantaneous value of said angle modulation signal and an
10 instantaneous value of said first local oscillation signal from
which a component with a frequency of substantially 0 is removed,
and generating a second base band signal comprised of that of a
product of said instantaneous value of said angle modulation
signal and an instantaneous value of said first phase signal from
15 which a component with a frequency of substantially 0 is removed;

a second oscillator for generating a second local
oscillation signal and a second phase signal whose phase differs
from that of said second local oscillation signal substantially
by 90 degrees;

20 a second mixer for receiving said first and second base band
signals from said first mixer, receiving said second local
oscillation signal and said second phase signal from said second

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oscillator, and generating an intermediate frequency signal
representing a sum of or a difference between a product of an
25 instantaneous value of said first base band signal and an
instantaneous value of said second local oscillation signal and a
product of an instantaneous value of said second base band signal
and an instantaneous value of said second phase signal; and
a demodulator for receiving said intermediate frequency
30 signal from said second mixer and demodulating said intermediate
frequency signal to thereby generate an angle demodulation
signal,

said second oscillator including a reference oscillator for
generating a reference oscillation signal, and a frequency
35 divider for generating said second local oscillation signal whose
frequency is substantially equal to a difference between or a sum
of a predetermined intermediate frequency signal and an offset
frequency of a predetermined range by frequency-dividing said
reference oscillation signal by a predetermined first frequency
40 dividing ratio,

said first oscillator including a variable frequency
oscillator for receiving said reference oscillation signal and
generating said first local oscillation signal whose frequency is
substantially equal to a sum of or a difference between a carrier
45 frequency of said angle modulation signal and said offset
frequency by generating a signal whose frequency converges to a

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frequency having a given ratio to a frequency of said received reference oscillation signal.

2. (Original) The angle demodulation apparatus according to claim 1, wherein said reference oscillator has a frequency control circuit for receiving said intermediate frequency signal and generating said reference oscillation signal whose frequency
5 is said frequency of said second local oscillation signal multiplied by said first frequency dividing ratio by generating a signal whose frequency converges to a frequency having a given ratio to a carrier frequency of said received intermediate frequency signal.

3. (Original) The angle demodulation apparatus according to claim 2, wherein said frequency control circuit has a first PLL (Phase-Locked Loop) control circuit for determining said frequency of said reference oscillation signal, based on a phase
5 difference between a carrier component of said received intermediate frequency signal and a signal acquired by frequency-dividing said reference oscillation signal by a predetermined second frequency dividing ratio, in such a way that said frequency of said reference oscillation signal converges to
10 a value having a given ratio to a frequency of said carrier

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component, and generating said reference oscillation signal having said determined frequency.

4. (Original) The angle demodulation apparatus according to claim 3, wherein said variable frequency oscillator has a second PLL (Phase-Locked Loop) control circuit for determining said frequency of said first local oscillation signal, based on a
5 phase difference between a signal acquired by frequency-dividing said received reference oscillation signal by a predetermined third frequency dividing ratio and a signal acquired by frequency-dividing said first local oscillation signal by a predetermined fourth frequency dividing ratio, in such a way that
10 said frequency of said first local oscillation signal converges to a value having a given ratio to said frequency of said reference oscillation signal, and generating said first local oscillation signal having said determined frequency.

5. (Original) The angle demodulation apparatus according to claim 4, wherein said offset frequency lies within a range of 300 Hz.

6. (Original) The angle demodulation apparatus according to claim 4, wherein said first oscillator has means for changing said ratio of said value to which said frequency of said first

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local oscillation signal converges to said frequency of said
5 reference oscillation signal in accordance with manipulation by
an operator.

7. (Original) The angle demodulation apparatus according
to claim 1, wherein said variable frequency oscillator has a PLL
(Phase-Locked Loop) control circuit for determining said
frequency of said first local oscillation signal, based on a
5 phase difference between a signal acquired by frequency-dividing
said received reference oscillation signal by said predetermined
first frequency dividing ratio and a signal acquired by
frequency-dividing said first local oscillation signal by a
predetermined second frequency dividing ratio, in such a way that
10 said frequency of said first local oscillation signal converges
to a value having a given ratio to said frequency of said
reference oscillation signal, and generating said first local
oscillation signal having said determined frequency.

Claims 8-13 (Canceled).

14. (Original) A local oscillation apparatus for supplying
a frequency converting apparatus for generating a base band
signal based on a first local oscillation signal and an angle
modulation signal and generating an intermediate frequency signal

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- 5 based on a second local oscillation signal and said base band
signal, with said first and second local oscillation signals,
said local oscillation apparatus comprising:
- a reference oscillator for generating a reference
oscillation signal;
- 10 a frequency divider for generating said second local
oscillation signal whose frequency is substantially equal to a
difference between or a sum of a predetermined intermediate
frequency signal and an offset frequency of a predetermined range
by frequency-dividing said reference oscillation signal by a
- 15 predetermined first frequency dividing ratio; and
- a variable frequency oscillator for receiving said reference
oscillation signal and generating said first local oscillation
signal whose frequency is substantially equal to a sum of or a
difference between a carrier frequency of said angle modulation
- 20 signal and said offset frequency by generating a signal whose
frequency converges to a frequency having a given ratio to a
frequency of said received reference oscillation signal.

15. (Original) The local oscillation apparatus according
to claim 14, wherein said reference oscillator has a frequency
control circuit for receiving said intermediate frequency signal
and generating said reference oscillation signal whose frequency
- 5 is said frequency of said second local oscillation signal

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multiplied by said first frequency dividing ratio by generating a signal whose frequency converges to a frequency having a given ratio to a carrier frequency of said received intermediate frequency signal.

16. (Original) The local oscillation apparatus according to claim 15, wherein said frequency control circuit has a first PLL (Phase-Locked Loop) control circuit for determining said frequency of said reference oscillation signal, based on a phase difference between a carrier component of said received intermediate frequency signal and a signal acquired by frequency-dividing said reference oscillation signal by a predetermined second frequency dividing ratio, in such a way that said frequency of said reference oscillation signal converges to a value having a given ratio to a frequency of said carrier component, and generating said reference oscillation signal having said determined frequency.

17. (Original) The local oscillation apparatus according to claim 16, wherein said variable frequency oscillator has a second PLL (Phase-Locked Loop) control circuit for determining said frequency of said first local oscillation signal, based on a phase difference between a signal acquired by frequency-dividing said received reference oscillation signal by a predetermined

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third frequency dividing ratio and a signal acquired by
frequency-dividing said first local oscillation signal by a
predetermined fourth frequency dividing ratio, in such a way that
10 said frequency of said first local oscillation signal converges
to a value having a given ratio to said frequency of said
reference oscillation signal, and generating said first local
oscillation signal having said determined frequency.

18. (Original) The local oscillation apparatus according
to claim 17, wherein said offset frequency lies within a range of
300 Hz.

19. (Original) The local oscillation apparatus according
to claim 17, wherein said first oscillator has means for changing
said ratio of said value to which said frequency of said first
local oscillation signal converges to said frequency of said
5 reference oscillation signal in accordance with manipulation by
an operator.

20. (Original) The local oscillation apparatus according
to claim 14, wherein said variable frequency oscillator has a PLL
(Phase-Locked Loop) control circuit for determining said
frequency of said first local oscillation signal, based on a
5 phase difference between a signal acquired by frequency-dividing

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10 said received reference oscillation signal by said predetermined first frequency dividing ratio and a signal acquired by frequency-dividing said first local oscillation signal by a predetermined second frequency dividing ratio, in such a way that said frequency of said first local oscillation signal converges to a value having a given ratio to said frequency of said reference oscillation signal, and generating said first local oscillation signal having said determined frequency.

21. (Original) An angle demodulation method comprising the steps of:

5 generating a first local oscillation signal and a first phase signal whose phase differs from that of said first local oscillation signal substantially by 90 degrees;

10 externally receiving an angle modulation signal, generating a first base band signal comprised of that of a product of an instantaneous value of said angle modulation signal and an instantaneous value of said first local oscillation signal from which a component with a frequency of substantially 0 is removed, and generating a second base band signal comprised of that of a product of said instantaneous value of said angle modulation signal and an instantaneous value of said first phase signal from which a component with a frequency of substantially 0 is removed;

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15 generating a second local oscillation signal and a second
phase signal whose phase differs from that of said second local
oscillation signal substantially by 90 degrees;

 generating an intermediate frequency signal representing a
sum of or a difference between a product of an instantaneous
20 value of said first base band signal and an instantaneous value
of said second local oscillation signal and a product of an
instantaneous value of said second base band signal and an
instantaneous value of said second phase signal; and

 generating an angle demodulation signal by detecting said
25 intermediate frequency signal,

 whereby said second local oscillation signal has a frequency
substantially equal to a difference between or a sum of a
predetermined intermediate frequency signal and an offset
frequency of a predetermined range and is generated by
30 frequency-dividing a reference oscillation signal by a
predetermined first frequency dividing ratio, and

 said first local oscillation signal has a frequency
substantially equal to a sum of or a difference between a carrier
frequency of said angle modulation signal and said offset
35 frequency and is generated by generating a signal whose frequency
converges to a frequency having a given ratio to a frequency of
said received reference oscillation signal.

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Claim 22 (Canceled).

23. (Original) A local oscillation signal generating method of supplying a frequency converting apparatus for generating a base band signal based on a first local oscillation signal and an angle modulation signal and generating an
5 intermediate frequency signal based on a second local oscillation signal and said base band signal, with said first and second local oscillation signals, said method comprising the steps of:

generating a reference oscillation signal;

generating said second local oscillation signal whose
10 frequency is substantially equal to a difference between or a sum of a predetermined intermediate frequency signal and an offset frequency of a predetermined range by frequency-dividing said reference oscillation signal by a predetermined first frequency dividing ratio; and

15 generating said first local oscillation signal whose frequency is substantially equal to a sum of or a difference between a carrier frequency of said angle modulation signal and said offset frequency by generating a signal whose frequency converges to a frequency having a given ratio to a frequency of
20 said received reference oscillation signal.

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24. (Original) A computer readable recording medium having recorded a program for allowing a computer to function as:

a first oscillator for generating a first local oscillation signal and a first phase signal whose phase differs from that of said first local oscillation signal substantially by 90 degrees,

a first mixer for externally receiving an angle modulation signal, receiving said first local oscillation signal and said first phase signal from said first oscillator, generating a first base band signal comprised of that of a product of an

instantaneous value of said angle modulation signal and an instantaneous value of said first local oscillation signal from which a component with a frequency of substantially 0 is removed, and generating a second base band signal comprised of that of a product of said instantaneous value of said angle modulation signal and an instantaneous value of said first phase signal from which a component with a frequency of substantially 0 is removed,

a second oscillator for generating a second local oscillation signal and a second phase signal whose phase differs from that of said second local oscillation signal substantially by 90 degrees,

a second mixer for receiving said first and second base band signals from said first mixer, receiving said second local oscillation signal and said second phase signal from said second oscillator, and generating an intermediate frequency signal

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25 representing a sum of or a difference between a product of an
instantaneous value of said first base band signal and an
instantaneous value of said second local oscillation signal and a
product of an instantaneous value of said second base band signal
and an instantaneous value of said second phase signal, and
30 a demodulator for receiving said intermediate frequency
signal from said second mixer and demodulating said intermediate
frequency signal to thereby generate an angle demodulation
signal;
for allowing said second oscillator to function as a
35 reference oscillator for generating a reference oscillation
signal, and a frequency divider for generating said second local
oscillation signal whose frequency is substantially equal to a
difference between or a sum of a predetermined intermediate
frequency signal and an offset frequency of a predetermined range
40 by frequency-dividing said reference oscillation signal by a
predetermined first frequency dividing ratio; and
for allowing said first oscillator to function as a variable
frequency oscillator for receiving said reference oscillation
signal and generating said first local oscillation signal whose
45 frequency is substantially equal to a sum of or a difference
between a carrier frequency of said angle modulation signal and
said offset frequency by generating a signal whose frequency

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converges to a frequency having a given ratio to a frequency of
said received reference oscillation signal.

Claim 25 (Canceled).

26. (Original) A computer readable recording medium having
recorded a program for allowing a computer to function as a local
oscillation apparatus for supplying a frequency converting
apparatus for generating a base band signal based on a first
5 local oscillation signal and an angle modulation signal and
generating an intermediate frequency signal based on a second
local oscillation signal and said base band signal, with said
first and second local oscillation signals, and allowing said
local oscillation apparatus to function as:

10 a reference oscillator for generating a reference
oscillation signal;

a frequency divider for generating said second local
oscillation signal whose frequency is substantially equal to a
difference between or a sum of a predetermined intermediate
15 frequency signal and an offset frequency of a predetermined range
by frequency-dividing said reference oscillation signal by a
predetermined first frequency dividing ratio; and

a variable frequency oscillator for receiving said reference
oscillation signal and generating said first local oscillation

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20 signal whose frequency is substantially equal to a sum of or a difference between a carrier frequency of said angle modulation signal and said offset frequency by generating a signal whose frequency converges to a frequency having a given ratio to a frequency of said received reference oscillation signal.

27. (Original) A computer data signal, carried on a carrier wave, for allowing a computer to function as:

a first oscillator for generating a first local oscillation signal and a first phase signal whose phase differs from that of
5 said first local oscillation signal substantially by 90 degrees,
a first mixer for externally receiving an angle modulation signal, receiving said first local oscillation signal and said first phase signal from said first oscillator, generating a first base band signal comprised of that of a product of an
10 instantaneous value of said angle modulation signal and an instantaneous value of said first local oscillation signal from which a component with a frequency of substantially 0 is removed, and generating a second base band signal comprised of that of a product of said instantaneous value of said angle modulation
15 signal and an instantaneous value of said first phase signal from which a component with a frequency of substantially 0 is removed,
a second oscillator for generating a second local oscillation signal and a second phase signal whose phase differs

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from that of said second local oscillation signal substantially
20 by 90 degrees,

a second mixer for receiving said first and second base band
signals from said first mixer, receiving said second local
oscillation signal and said second phase signal from said second
oscillator, and generating an intermediate frequency signal
25 representing a sum of or a difference between a product of an
instantaneous value of said first base band signal and an
instantaneous value of said second local oscillation signal and a
product of an instantaneous value of said second base band signal
and an instantaneous value of said second phase signal, and

30 a demodulator for receiving said intermediate frequency
signal from said second mixer and demodulating said intermediate
frequency signal to thereby generate an angle demodulation
signal;

for allowing said second oscillator to function as a
35 reference oscillator for generating a reference oscillation
signal, and a frequency divider for generating said second local
oscillation signal whose frequency is substantially equal to a
difference between or a sum of a predetermined intermediate
frequency signal and an offset frequency of a predetermined range
40 by frequency-dividing said reference oscillation signal by a
predetermined first frequency dividing ratio; and

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for allowing said first oscillator to function as a variable frequency oscillator for receiving said reference oscillation signal and generating said first local oscillation signal whose
45 frequency is substantially equal to a sum of or a difference between a carrier frequency of said angle modulation signal and said offset frequency by generating a signal whose frequency converges to a frequency having a given ratio to a frequency of said received reference oscillation signal.

Claim 28 (Canceled).

29. (Original) A computer data signal, carried on a carrier wave, for allowing a computer to function as a local oscillation apparatus for supplying a frequency converting apparatus for generating a base band signal based on a first
5 local oscillation signal and an angle modulation signal and generating an intermediate frequency signal based on a second local oscillation signal and said base band signal, with said first and second local oscillation signals, and allowing said local oscillation apparatus to function as:
10 a reference oscillator for generating a reference oscillation signal;

a frequency divider for generating said second local oscillation signal whose frequency is substantially equal to a

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15 difference between or a sum of a predetermined intermediate
frequency signal and an offset frequency of a predetermined range
by frequency-dividing said reference oscillation signal by a
predetermined first frequency dividing ratio; and

20 a variable frequency oscillator for receiving said reference
oscillation signal and generating said first local oscillation
signal whose frequency is substantially equal to a sum of or a
difference between a carrier frequency of said angle modulation
signal and said offset frequency by generating a signal whose
frequency converges to a frequency having a given ratio to a
frequency of said received reference oscillation signal.

30. (New) An angle demodulation apparatus comprising:

a first oscillation section for generating, based on a
reference oscillation signal, a first local oscillation signal
whose frequency is substantially equal to a sum of or a
5 difference between a carrier frequency of an angle modulation
signal and an offset frequency of a predetermined range and a
first phase signal whose phase differs from that of said first
local oscillation signal substantially by 90 degrees;

10 a first mixing section for externally receiving an angle
modulation signal, receiving said first local oscillation signal
and said first phase signal from said first oscillation section,
generating a first base band signal comprised of that of a

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product of an instantaneous value of said angle modulation signal
and an instantaneous value of said first local oscillation signal
15 from which a component with a frequency of substantially 0 is
removed, and generating a second base band signal comprised of
that of a product of said instantaneous value of said angle
modulation signal and an instantaneous value of said first phase
signal from which a component with a frequency of substantially 0
20 is removed;

a second oscillation section for generating, based on said
reference oscillation signal, a second local oscillation signal
whose frequency is substantially equal to a difference between or
a sum of a predetermined intermediate frequency signal and said
25 offset frequency and a second phase signal whose phase differs
from that of said second local oscillation signal substantially
by 90 degrees;

a second mixing section for receiving said first and second
base band signals from said first mixing section, receiving said
30 second local oscillation signal and said second phase signal from
said second oscillation section, and generating an intermediate
frequency signal representing a sum of or a difference between a
product of an instantaneous value of said first base band signal
and an instantaneous value of said second local oscillation
35 signal and a product of an instantaneous value of said second

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base band signal and an instantaneous value of said second phase signal; and

a demodulation section for receiving said intermediate frequency signal from said second mixing section and demodulating
40 said intermediate frequency signal to thereby generate an angle demodulation signal.

31. (New) An angle demodulation method comprising:

generating, based on a reference oscillation signal, a first local oscillation signal whose frequency is substantially equal to a sum of or a difference between a carrier frequency of an
5 angle modulation signal and an offset frequency of a predetermined range and a first phase signal whose phase differs from that of said first local oscillation signal substantially by 90 degrees;

externally receiving an angle modulation signal, generating
10 a first base band signal comprised of that of a product of an instantaneous value of said angle modulation signal and an instantaneous value of said first local oscillation signal from which a component with a frequency of substantially 0 is removed, and generating a second base band signal comprised of that of a
15 product of said instantaneous value of said angle modulation signal and an instantaneous value of said first phase signal from which a component with a frequency of substantially 0 is removed;

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generating, based on said reference oscillation signal, a
second local oscillation signal whose frequency is substantially
20 equal to a difference between or a sum of a predetermined
intermediate frequency signal and said offset frequency and a
second phase signal whose phase differs from that of said second
local oscillation signal substantially by 90 degrees;

generating an intermediate frequency signal representing a
25 sum of or a difference between a product of an instantaneous
value of said first base band signal and an instantaneous value
of said second local oscillation signal and a product of an
instantaneous value of said second base band signal and an
instantaneous value of said second phase signal; and

30 generating an angle demodulation signal by detecting said
intermediate frequency signal.

32. (New) A computer readable recording medium having
recorded a program for allowing a computer to function as:

a first oscillation section for generating, based on a
reference oscillation signal, a first local oscillation signal
5 whose frequency is substantially equal to a sum of or a
difference between a carrier frequency of an angle modulation
signal and an offset frequency of a predetermined range and a
first phase signal whose phase differs from that of said first
local oscillation signal substantially by 90 degrees,

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10 a first mixing section for externally receiving an angle
modulation signal, receiving said first local oscillation signal
and said first phase signal from said first oscillation section,
generating a first base band signal comprised of that of a
product of an instantaneous value of said angle modulation signal
15 and an instantaneous value of said first local oscillation signal
from which a component with a frequency of substantially 0 is
removed, and generating a second base band signal comprised of
that of a product of said instantaneous value of said angle
modulation signal and an instantaneous value of said first phase
20 signal from which a component with a frequency of substantially 0
is removed,

a second oscillation section for generating, based on said
reference oscillation signal, a second local oscillation signal
whose frequency is substantially equal to a difference between or
25 a sum of a predetermined intermediate frequency signal and said
offset frequency and a second phase signal whose phase differs
from that of said second local oscillation signal substantially
by 90 degrees,

a second mixing section for receiving said first and second
30 base band signals from said first mixing section, receiving said
second local oscillation signal and said second phase signal from
said second oscillation section, and generating an intermediate
frequency signal representing a sum of or a difference between a

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product of an instantaneous value of said first base band signal
35 and an instantaneous value of said second local oscillation
signal and a product of an instantaneous value of said second
base band signal and an instantaneous value of said second phase
signal, and

a demodulation section for receiving said intermediate
40 frequency signal from said second mixing section and demodulating
said intermediate frequency signal to thereby generate an angle
demodulation signal.

33. (New) A computer data signal, carried on a carrier
wave, for allowing a computer to function as:

a first oscillation section for generating, based on a
reference oscillation signal, a first local oscillation signal
5 whose frequency is substantially equal to a sum of or a
difference between a carrier frequency of an angle modulation
signal and an offset frequency of a predetermined range and a
first phase signal whose phase differs from that of said first
local oscillation signal substantially by 90 degrees,

10 a first mixing section for externally receiving an angle
modulation signal, receiving said first local oscillation signal
and said first phase signal from said first oscillation section,
generating a first base band signal comprised of that of a
product of an instantaneous value of said angle modulation signal

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15 and an instantaneous value of said first local oscillation signal
from which a component with a frequency of substantially 0 is
removed, and generating a second base band signal comprised of
that of a product of said instantaneous value of said angle
modulation signal and an instantaneous value of said first phase
20 signal from which a component with a frequency of substantially 0
is removed,

a second oscillation section for generating, based on said
reference oscillation signal, a second local oscillation signal
whose frequency is substantially equal to a difference between or
25 a sum of a predetermined intermediate frequency signal and said
offset frequency and a second phase signal whose phase differs
from that of said second local oscillation signal substantially
by 90 degrees,

a second mixing section for receiving said first and second
30 base band signals from said first mixing section, receiving said
second local oscillation signal and said second phase signal from
said second oscillation section, and generating an intermediate
frequency signal representing a sum of or a difference between a
product of an instantaneous value of said first base band signal
35 and an instantaneous value of said second local oscillation
signal and a product of an instantaneous value of said second
base band signal and an instantaneous value of said second phase
signal, and

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40 a demodulation section for receiving said intermediate
frequency signal from said second mixing section and demodulating
said intermediate frequency signal to thereby generate an angle
demodulation signal.